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H<sub>2</sub>O Flow



Purge Flow



ZrCl<sub>4</sub> Flow



FIG. 1

Precursor Flow



Purge Flow



Oxidizer Flow



FIG. 2

80

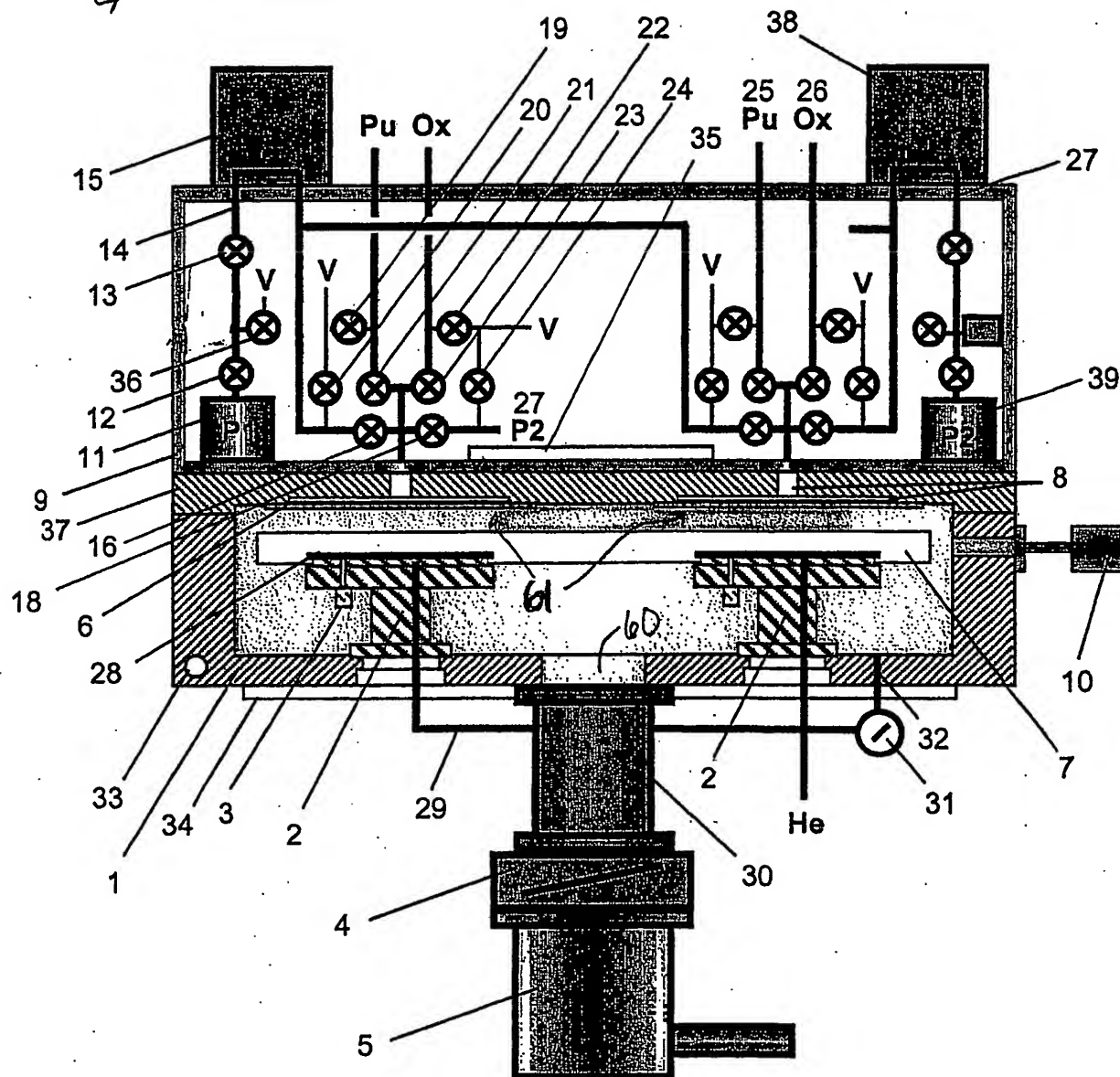


FIG-3

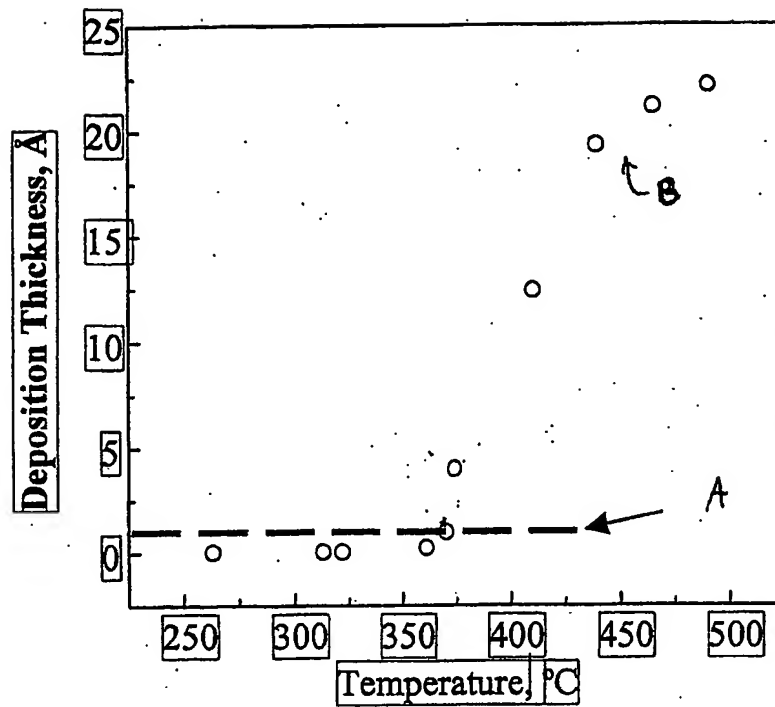


FIG. 4

Showerhead holes	220
Hole length	6.1 mm
Hole Diameter	0.97 mm
Line I.D.	10.7 mm
Line Lenth	560 mm
Chamber Pressure	1.0 mT
Plenum Pressure	2.4 mT
Valve Inlet Pressure	21.6 mT
Flow Controller Exit Press.	50.0 mT
Flow Controller Inlet Press.	>100 mT
Vapor Pressure Requirement	>300 mT
HTB Temperature Requirement	< 41 °C

Figure 5. Backpressure model results for a 1 sccm flow of HTB.

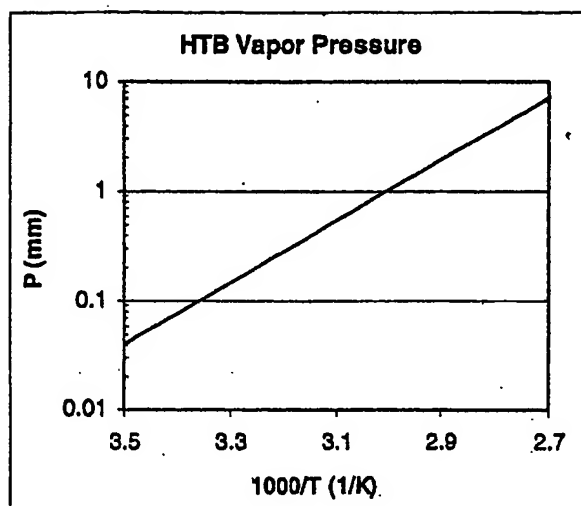


Figure 6. Vapor pressure curve for Hafnium tert-Butoxide (HBT), showing a vapor pressure of 1 torr @ 60 °C and 0.3 torr @ 41 °C. (Schumacher data sheet)

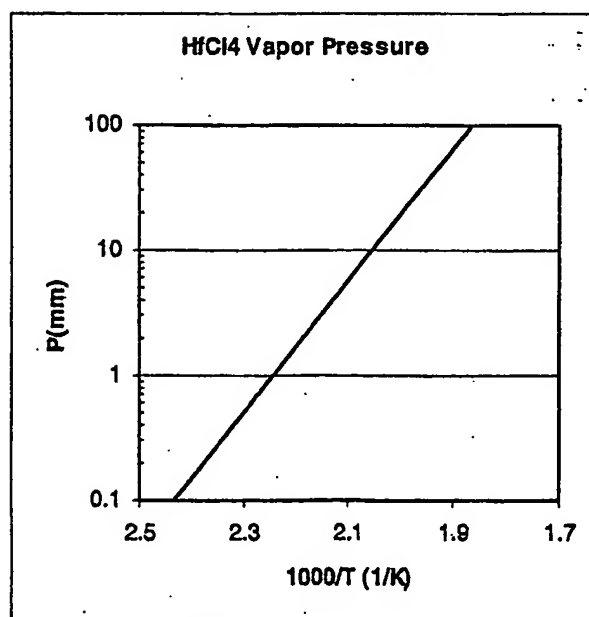


Figure 7. Vapor pressure curve for HfCl<sub>4</sub>, showing a vapor pressure of 1 torr @ 172 °C and 0.3 torr @ 152 °C. (Schumacher data sheet)

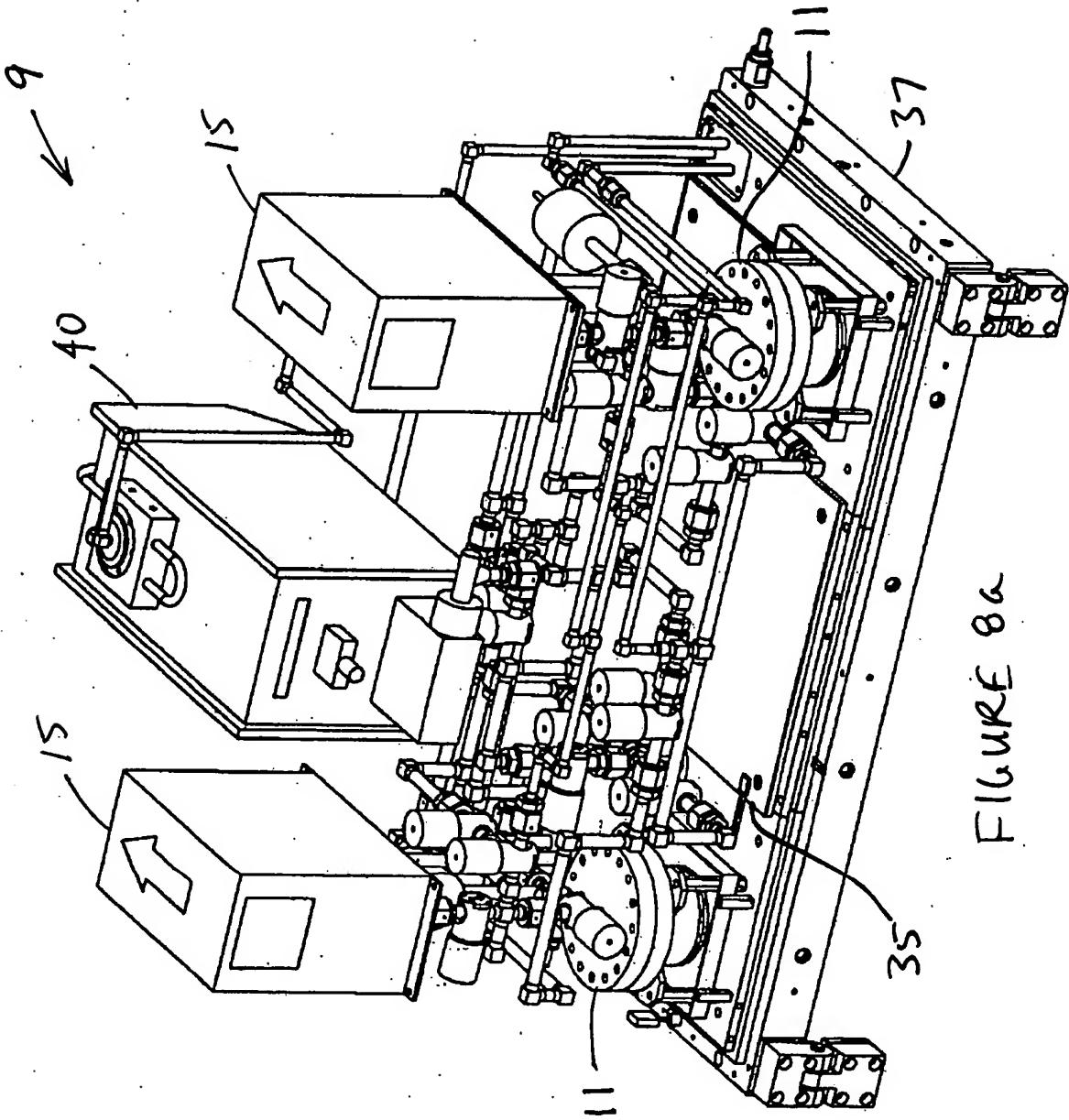


FIGURE 8a

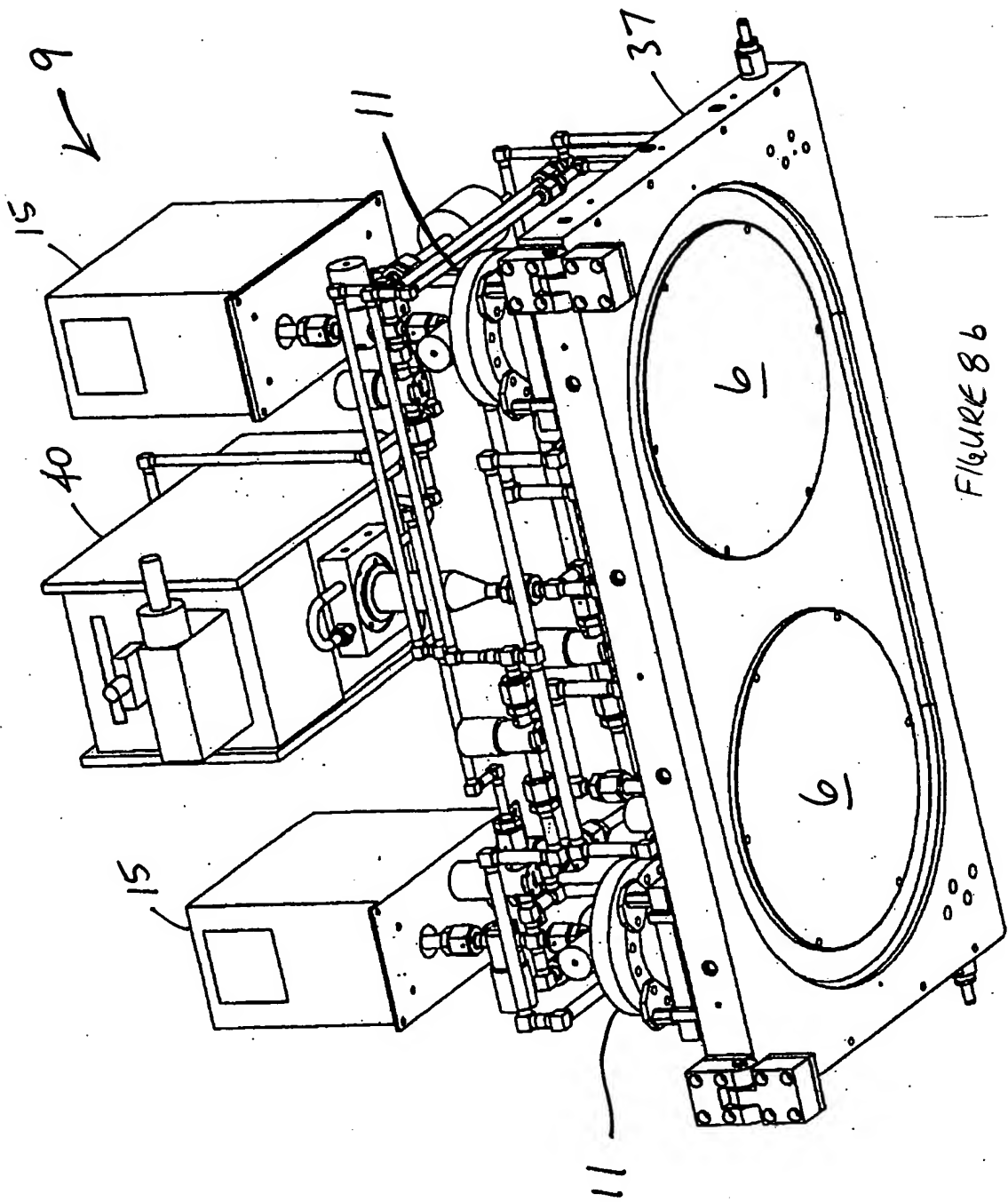


FIGURE 86

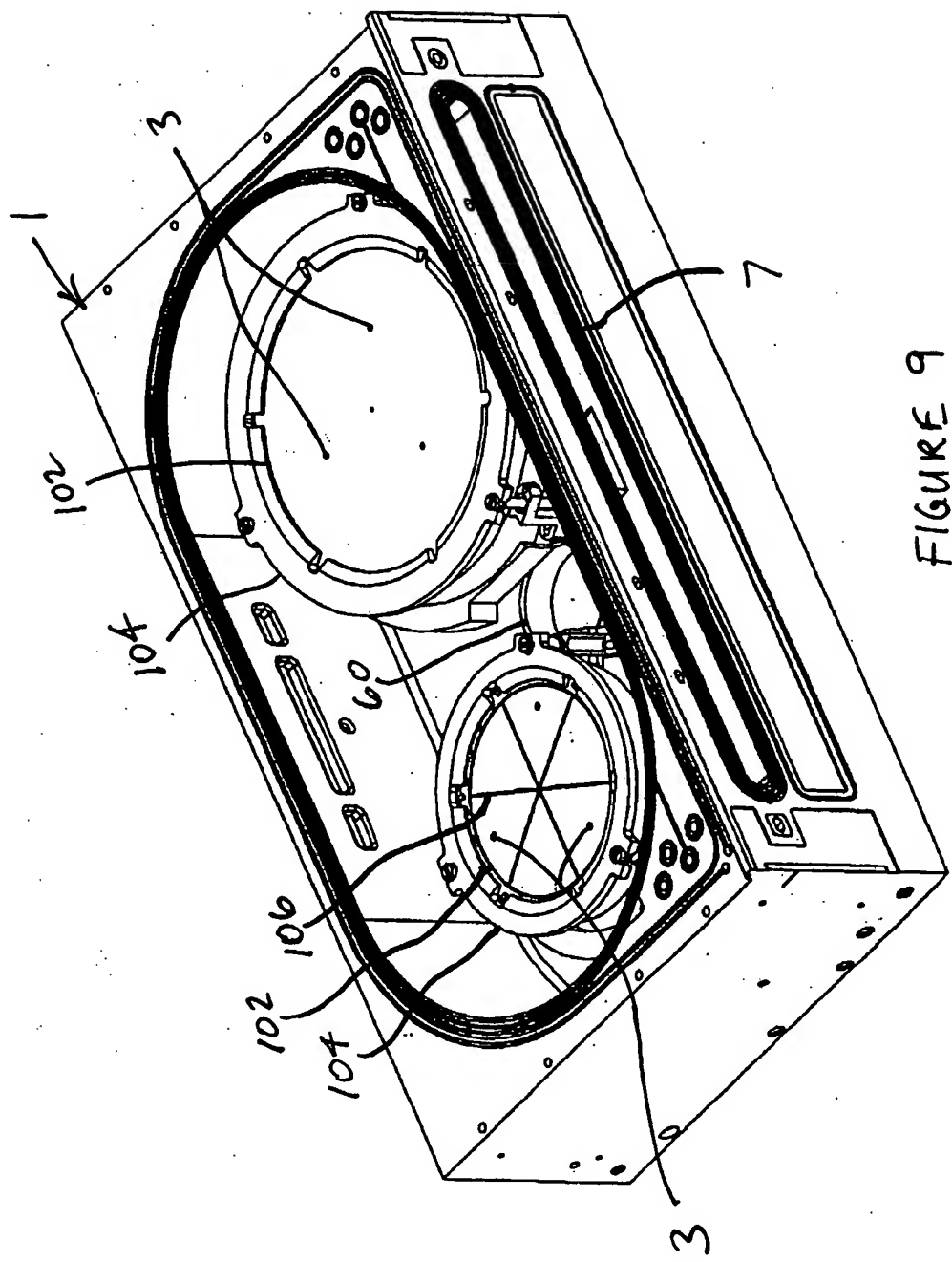
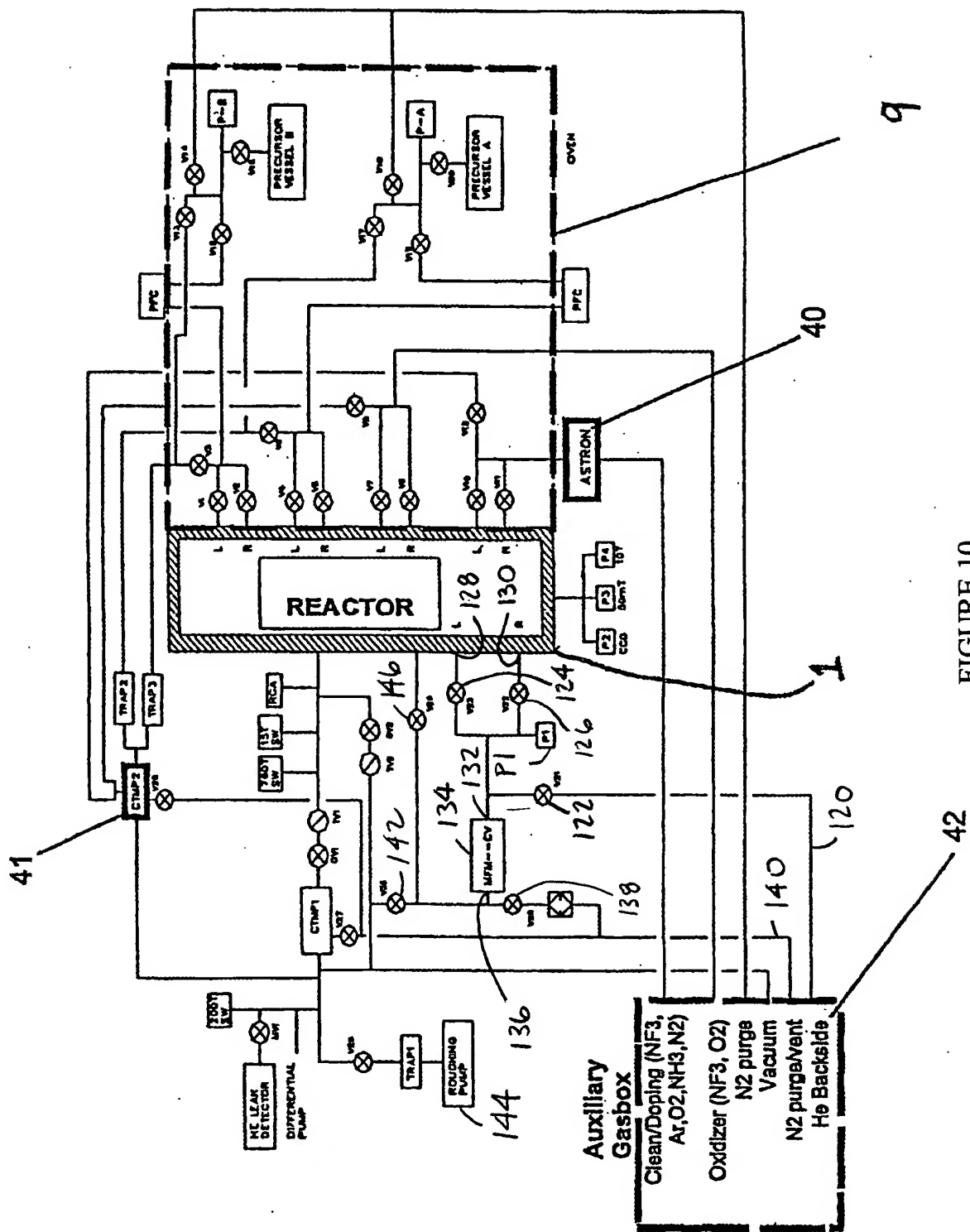


FIGURE 9





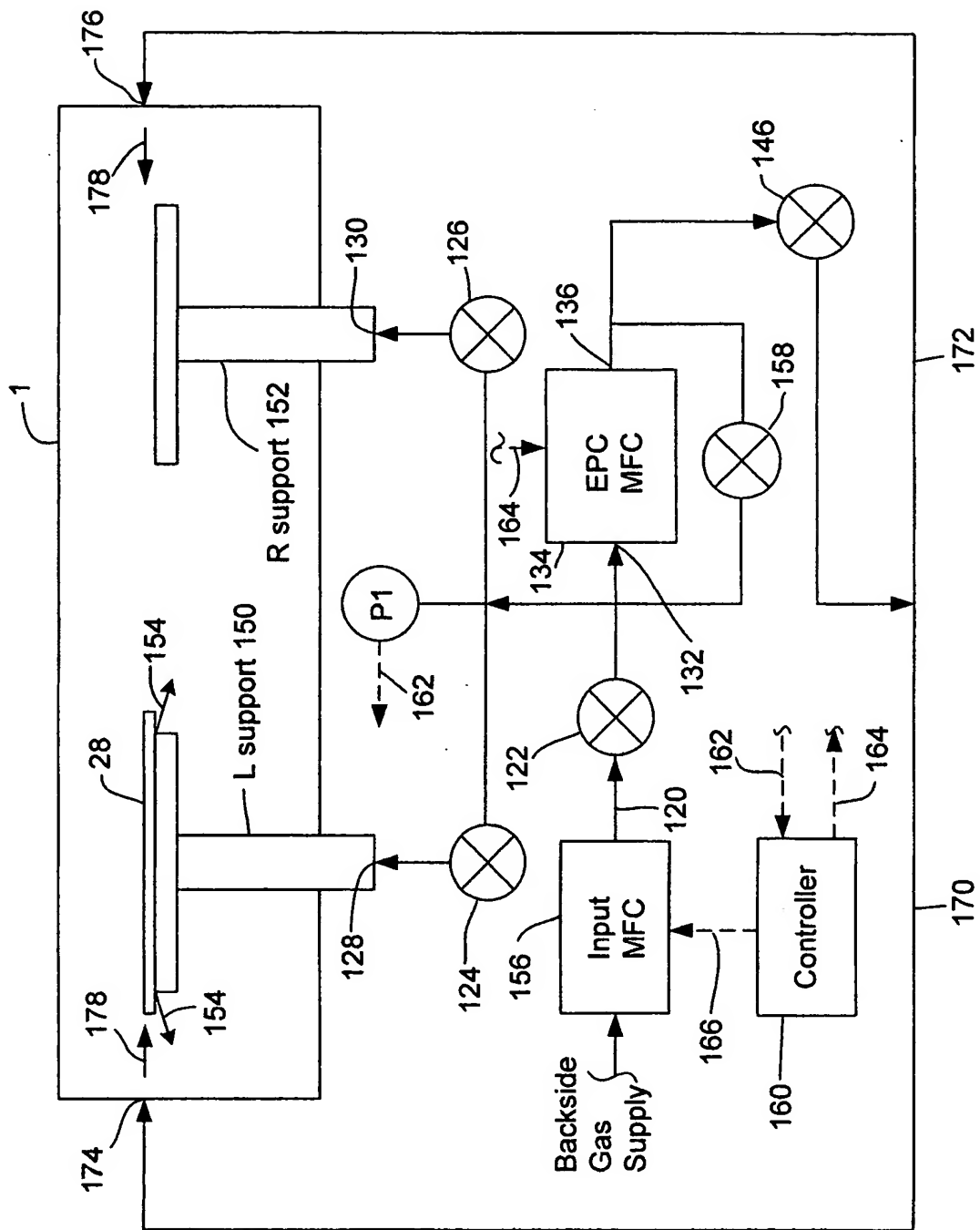


FIGURE 11